

TWO EUROPEAN SPECIES OF *CHELOSTOMA*
ESTABLISHED IN NEW YORK STATE
(HYMENOPTERA: MEGACHILIDAE)*

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INTRODUCTION

Chelostoma is a Holarctic genus of slender, black megachiline bees that is widespread in the Palearctic region and has eight species in western North America. The Nearctic species all occur in California, with the range of two extending northward to Washington, one of which also occurs eastward to Utah and Idaho (Hurd and Michener, 1955). No native *Chelostoma* occur east of the Rocky Mountains. *Chelostoma* is replaced east of the Great Plains by the closely related genus *Prochelostoma*, which contains one species, *P. philadelphi* (Robertson). However, *Chelostoma* has recently become established in northeastern United States, where two European species, *C. campanularum* (Kirby) and *C. fuliginosum* (Panzer), have been collected in several localities in central New York State (Fig. 1).

TAXONOMY

Both European species key to *Chelostoma* in the keys to genera of Megachilini in Michener (1944) and Hurd and Michener (1955). Like the native Nearctic *Chelostoma*, the two European species possess a longitudinal carina along the inner ventral angle of each hind coxa and have the third segment of the labial palp flattened and connate with the second. These characters are often difficult to see in pinned specimens. This was of little practical consequence because they served in keys to separate *Chelostoma* from *Prochelostoma*, and the native ranges of these genera do not overlap. *Prochelostoma philadelphi*, however, is common in New York where the European *Chelostoma* are now established. I suggest the

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Figure 1. Distribution of *Chelostoma* in New York State.

following modification of Mitchell's (1962, p. 5) key to genera of eastern United States Megachilidae:

11. Metasomal (=gastral¹) tergum I with anterior surface broadly concave, distinctly separated from dorsal surface by line or carina 12
 Metasomal tergum I with anterior surface at most narrowly concave or merely sulcate medially, not separated from dorsal surface by line or carina 13
- 12 (11). Anterior concavity of metasomal tergum I lined dorsally by sharply carinate rim; anterior surface of mesepisternum not separated from lateral surface by carina *Heriades*
 Anterior concavity of metasomal tergum I not lined by distinct carina; anterior surface of mesepisternum nearly impunctate, separated from lateral surface by carina *Ashmeadiella*
- 13 (11). Propodeum with distinct, horizontal, pitted or rugose basal zone; form slender, shortest distance between tegulae equal to or less than length of mesoscutum 14

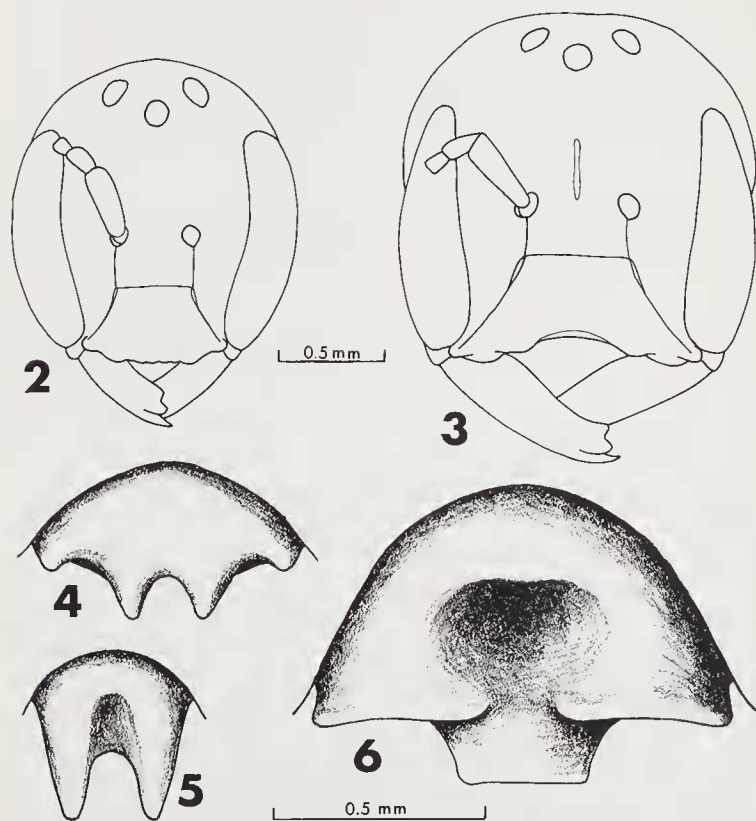
1. =abdominal of Mitchell (1962).

- Propodeum sloping to posterior surface, without distinct, horizontal, basal zone; form robust to slender, shortest distance between tegulae greater than length of mesoscutum 15
- 14 (13). Labial palp with 2 free segments; female with clypeus emarginate apically and with mandible over $3/4$ as long as eye (Fig. 3); male with apex of metasomal tergum VII quadridentate, lateral teeth short and obtuse (Fig. 4) *Prochelostoma*
- Labial palp with 1 free segment; female with clypeus uniformly convex and with mandible less than $2/3$ as long as eye (Fig. 2); male with apex of metasomal tergum VII bidentate (Fig. 5) or with 3 truncate processes (Fig. 6) *Chelostoma*
- 15 (13). Notaulices elongate-linear; black (in all eastern species) *Hoplitis*
- Notaulices punctiform-oval; usually metallic blue or green, rarely black *Osmia*

The males of the two introduced species of *Chelostoma* can be readily distinguished by the different shapes of their metasomal terga VII (Figs. 5–6). Female *C. fuliginosum* have apical, white, pubescent bands on metasomal terga I–IV; these bands are absent in *C. campanularum*. The size ranges of the two species do not overlap.

Chelostoma campanularum is synonymized with *C. florissomne* (Linnaeus) in some European literature (i.e., Schmiedeknecht, 1930; Stoeckert, 1933, 1954), but *florissomne* is actually a senior synonym of *C. maxillosum* (Linnaeus) (Richards, 1935). *Chelostoma campanularum* is a common species throughout Europe (except the far north), and occurs in Great Britain and north Africa. It is only 4.0 to 6.0 mm long and in general appearance greatly resembles smaller specimens of *Prochelostoma philadelphia* and to a lesser extent very small specimens of some species of *Hoplitis* (*Aldidamea*).

Chelostoma fuliginosum is frequently cited in the European literature under its junior synonyms *C. nigricorne* (Nylander) and *C. rapunculi* (Lepeletier). A complete synonymy, including three other, less-used, junior synonyms, is given by Tkalčá (1967). This species is common in northern and central Europe, although it is absent from Great Britain. It occurs sporadically in southern Europe and its range extends across the Soviet Union to Siberia. It is 7.0 to 9.0 mm



Figures 2-6. Fig. 2. Anterior view of head of *Chelostoma campanularum*, female. Fig. 3. Anterior view of head of *Prochelostoma philadelphi*, female. Fig. 4. Caudal view of metasomal tergum VII of *P. philadelphi*, male. Fig. 5. Caudal view of metasomal tergum VII of *C. campanularum*, male. Fig. 6. Caudal view of metasomal tergum VII of *Chelostoma fuliginosum*, male.

long, much larger than *C. campanularum*, and in general appearance more closely resembles some species of *Hoplitis* than it does *C. campanularum* and *P. philadelphi*.

Additional characters to distinguish northeastern *Hoplitis* from the introduced *Chelostoma* include the clypeal apex of the female, which in *Hoplitis* is flattened and greatly overhangs the base of the labrum,² while in *Chelostoma* it is evenly convex and barely exceeds the base of the labrum. The apex of metasomal tergum VII of male *Hoplitis* is broadly rounded, truncate, or with a single median spine, unlike that of either species of *Chelostoma* (Figs. 5-6).

Voucher specimens of *C. campanularum* and *fuliginosum* are deposited in the Cornell University insect collection, lot number 995, and in the American Museum of Natural History, The U. S. National Museum of Natural History, the University of Kansas Snow Museum, and the Museum of Comparative Zoology at Harvard University.

BIOLOGY

The biology of both species of *Chelostoma* in Europe has been studied; the most thorough account is by Käpylä (1978) in Finland (in which *C. fuliginosum* is cited as *C. rapunculi*). Nests of *C. fuliginosum* (cited as *C. nigricorne*) in Italy have been briefly described by Bonelli (1967), and in France by Correia (1976), and nests of *C. campanularum* (as *C. florisomne*) in Italy have been described by Grandi (1961).

Both species are univoltine, mid-to-late-summer bees, with flight periods in Europe from May or June to August or September (Benoist, 1929; Stoeckert, 1933; Correia, 1976; Käpylä, 1978). New York specimens of *C. campanularum* in the Cornell collection were captured from 1 July to 27 July, while specimens of *C. fuliginosum* were captured from 4 June to 26 July.

Chelostoma campanularum and *fuliginosum* are both strictly oligolectic for pollen on bellflowers, *Campanula* (Campanulaceae), although other flowers are commonly visited for nectar (Käpylä, 1978). In contrast, the western Nearctic *Chelostoma* are all or mostly oligolectic on Hydrophyllaceae, especially *Phacelia* and *Eriodictyon* (Hurd and Michener, 1955). *Prochelostoma philadel-*

2. Except in *Hoplitis* (*H.*) *anthocopoides*, which is a robust, *Osmia*-shaped species.

phi also collects pollen from Hydrophyllaceae (*Hydrophyllum*) as well as mock-orange, *Philadelphus* (Saxifragaceae) (Robertson, 1929), the plant on which it is most commonly collected in New York. In New York both species of *Chelostoma* commonly visit creeping bellflower, *Campanula rapunculoides*, a roadside weed introduced from Europe, which they share with the native oligolectic megachilid bee *Chalicodoma campanulae* (Robertson) and numerous polylectic bees. The *Chelostoma* also visit the native harebell, *Campanula rotundifolia*, as well as other introduced species of *Campanula* in gardens. Males of both species patrol *Campanula* and attempt to copulate with foraging females, as Käpylä (1978) observed in Finland. Males of *C. fuliginosum* and both sexes of *C. campanularum* often sleep in flowers of *Campanula* (Käpylä, 1978).

Both species construct their nests in pre-existing cavities. They prefer holes in old wood, including stumps, posts, and structural timbers (Frey-Gessner, 1909; Benoist, 1929; Stoeckert, 1933; Käpylä, 1978). *Chelostoma fuliginosum* will accept trap nests (Bonelli, 1967; Correia, 1976) and *C. campanularum* will nest in straws (Frey-Gessner, 1909; Grandi, 1961). *Chelostoma campanularum* uses 2.0- to 2.5-mm-diameter cavities while *C. fuliginosum* uses 4.0- to 5.0-mm-diameter cavities. Neither species lines its cell walls with foreign materials, and both construct their cell partitions and final closures with soil mixed with nectar (Käpylä, 1978), although Bonelli (1967) described a nest of *C. fuliginosum* with resin partitions.

DISTRIBUTION IN NEW YORK STATE

The earliest collections of *C. campanularum* and *fuliginosum* in New York were made in 1973 and 1962, respectively. The presently known range in New York is illustrated in Figure 1. Both species have been collected in Schoharie, Tompkins, and Ontario Counties, and *C. campanularum* has also been collected in Schuyler and Jefferson Counties. This is certainly not a complete picture, because there has been no systematic effort to collect these bees. Entomologists throughout the Northeast should watch their local bellflowers for *Chelostoma*.

DISCUSSION

At least eight exotic species of Megachilidae have accidentally become established in North America. Eickwort (1971) discussed five of these species: *Megachile rotundata* (Fabricius) (= *pacifica* (Panzer)), *Megachile concinna* Smith, *Megachile apicalis* Spinola, *Chalicodoma lanata* (Fabricius), *Anthidium manicatum* (Linnaeus), and *Hoplitis anthocopoides* (Schenck). Roberts (1978) has recently recorded the establishment in New Jersey of *Lithurge chrysurus* Fonscolombe, a native of the Mediterranean region, and the present paper reports the establishment of two Palearctic species of *Chelostoma* in New York. In addition, *Osmia cornifrons* (Radoszkowski) has been purposely introduced for fruit pollination into Utah and Maryland from Asia and appears to be established, at least in Maryland (Batra, 1979 and personal communication).

Although many megachilid bees excavate nests in soil (Eickwort *et al.*, 1981), all of these introduced species construct nests in cavities, bore into wood, or construct free-standing masonry nests. Human transport of substrates containing nests with diapausing bees probably was their mode of immigration. All of the introduced megachilids live in disturbed habitats and visit Old World garden flowers and weeds, either as generalists (*Megachile* spp., *Chalicodoma lanata*, *Anthidium manicatum*) or as specialists (*Chelostoma fuliginosum* and *campanularum* on *Campanula*, *Hoplitis anthocopoides* on *Echium*, and *Lithurge chrysurus* on *Centaurea*). The two species of *Chelostoma* compete for the same food resource but use different-diameter cavities for nests.

Surprisingly, four of these eight species are known only from central New York State (*H. anthocopoides*³, *A. manicatum*, *C. fuliginosum*, and *C. campanularum*). Indeed, on a pleasant July day the latter three species plus *M. rotundata* forage simultaneously in one of Cornell University's beautiful gardens. Ithaca, New York, is hardly a major port of entry, so I cannot explain this apidological touch of Europe that we enjoy.

3. After this paper was accepted for publication, *Hoplitis anthocopoides* was captured in Frederick Co., Virginia.

SUMMARY

The Palearctic species *Chelostoma campanularum* and *fuliginosum* have recently become established in central New York State. Mitchell's key to eastern U. S. megachilid genera is revised to include *Chelostoma*. They are distinguished from similar New York Megachilidae (*Prochelostoma* and *Hoplitis*) by the shape of metasomal tergum VII of the males and the clypeal apex of the females. Both species are oligolectic on bellflowers, *Campanula*, and construct nests in pre-existing cavities, primarily in old wood. Nine exotic species of megachilid bees have become established in North America, of which four⁴ are known only from New York State.

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4. See footnote 3 on previous page.

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